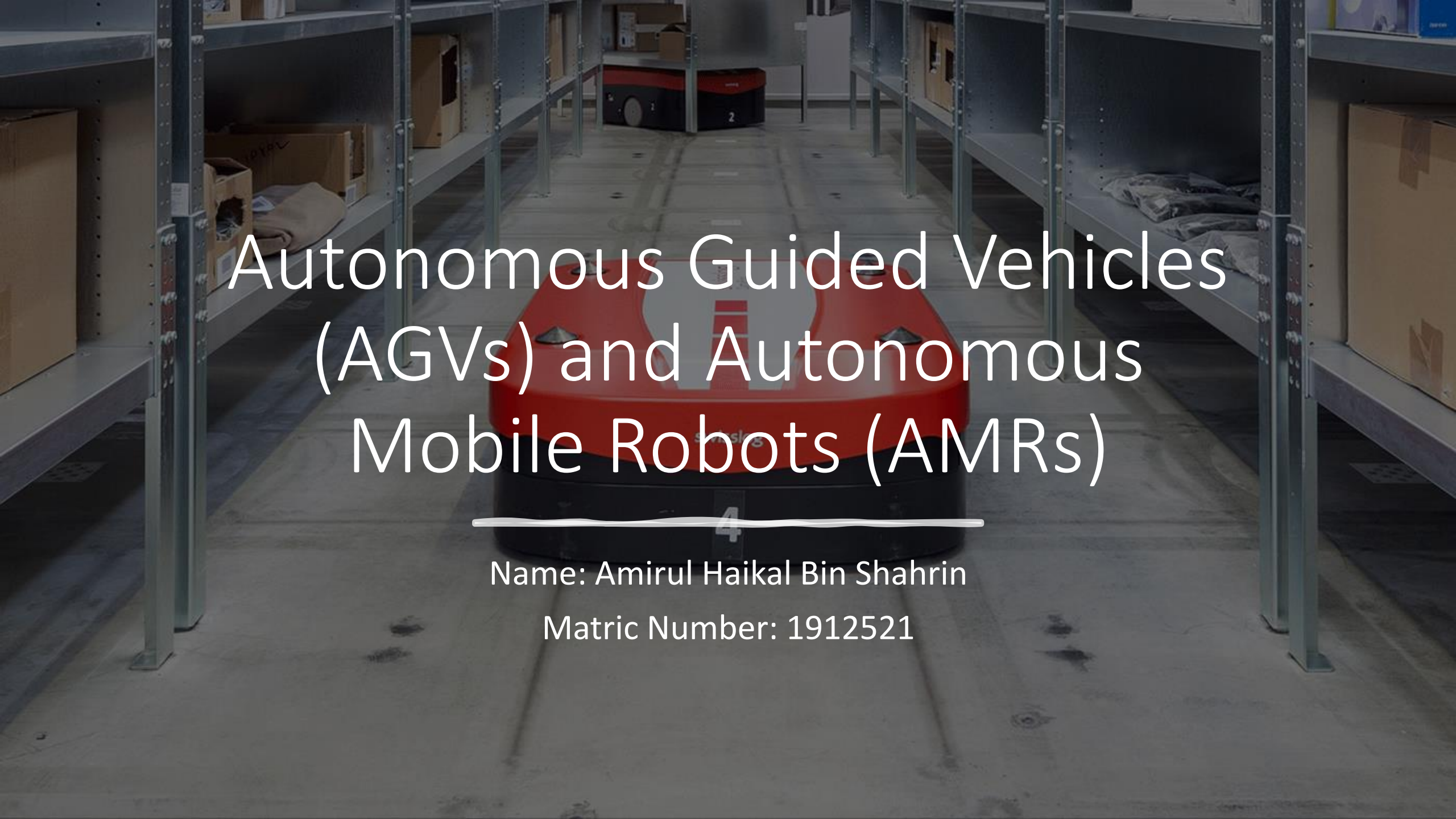

Autonomous Guided Vehicles (AGVs) and Autonomous Mobile Robots (AMRs)

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Introduction

- Autonomous Guided Vehicles (AGVs) and Autonomous Mobile Robots (AMRs) are self-contained, mobile machines used for transportation and material handling purposes.
- These machines rely heavily on hardware components to navigate, perceive their surroundings, and carry out their tasks.
- The main difference between an AGV and an AMR is that AMRs use free navigation by means of lasers, while AGVs are located with fixed elements: magnetic tapes, magnets, beacons, etc. So, to be effective, they must have a predictable route.

Main Components

1. Locomotion (Wheels, Tracks & Legs)
2. Control System (Microprocessors & Controllers)
3. Data Collection (Lidar, Vision & Ultrasonic Sensors)
4. Data Transmission (Wifi, Bluetooth, Cellular Modems & Ethernet Cable)
5. Actuation Hardware (Motors & Grippers)
6. Power Management (Batteries & Chargers)

Omron Automation

MiR100

Locomotion (Wheels)

- Wheels are the most common locomotion hardware used in AGVs and AMRs.
- They are used for movement on smooth and flat surfaces.

Boston Dynamics Spot

ANYbotics ANYmal

Locomotion (Legs)

- Legged robots are becoming increasingly popular in the field of AGVs/AMRs.
- They are used for navigating complex environments and overcoming obstacles.

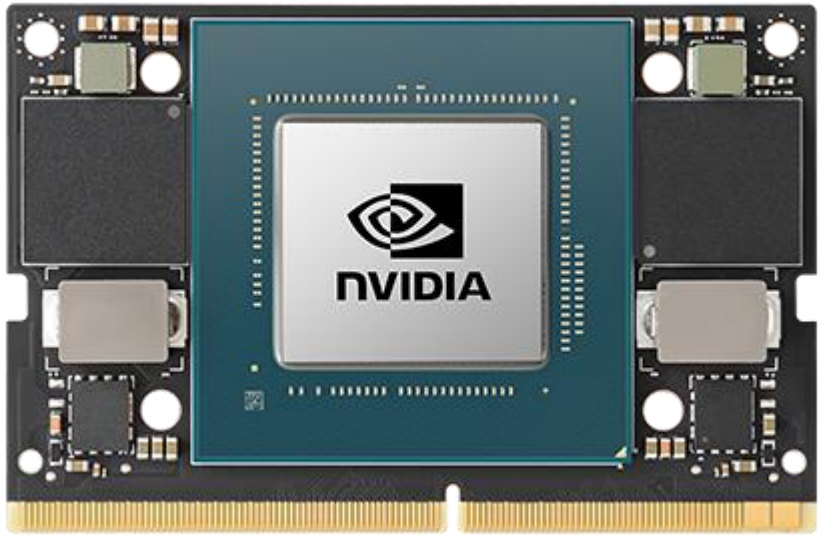
Locomotion (Tracks)

Clearpath Jackal

- Tracks are used in AGVs/AMRs to provide better traction and stability on uneven and rough terrain.
- One of the example of tracks used in AGVs/AMRs is Clearpath Jackal.

Control System (Microprocessors)

- Microprocessors are used to process sensory information and make decisions in real-time.
- They are used for navigation, obstacle avoidance, and control.
- Examples of microprocessors used in AGVs/AMRs are Intel Atom and Nvidia Jetson.

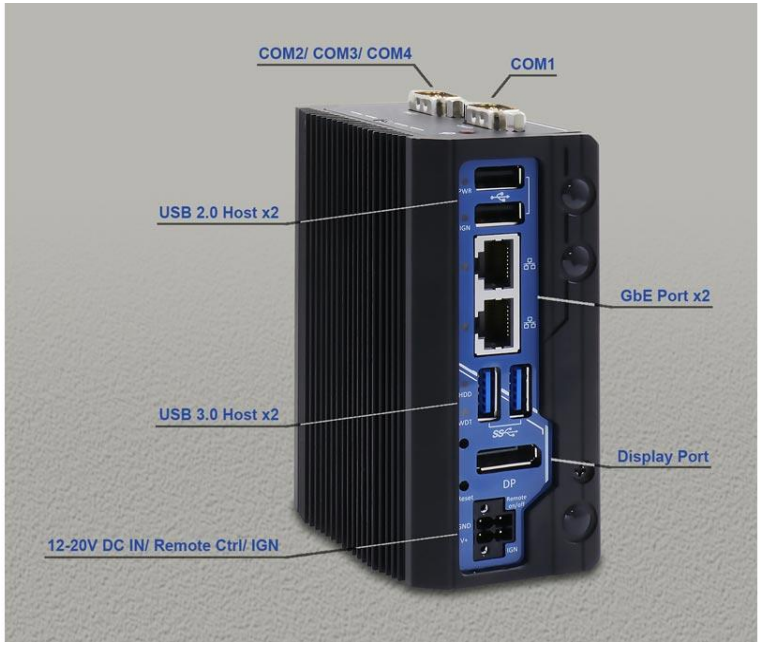


Nvidia Jetson

Intel Atom

Control System (Controllers)

- Controllers are used to manage the hardware components in AGVs/AMRs.
- They are responsible for coordinating the movements of the vehicle, receiving and interpreting sensor data, and executing tasks.
- Examples of controllers used in AGVs/AMRs are PLCs (Programmable Logic Controllers) and Embedded controllers.



Embedded Controllers

Programmable Logic Controllers (PLCs)

Data Collection (Lidar Sensors)

Velodyne Lidar

Sick Lidar

- Lidar (Light Detection and Ranging) sensors are used to provide a 3D view of the environment around the AGV/AMR by using laser beams to detect the distance of objects.
- Examples of Lidar sensors used in AGVs/AMRs are Velodyne Lidar and Sick Lidar.

Data Collection (Vision Sensors)

Intel RealSense

Basler Vision sensors

- Vision sensors use cameras to provide visual information to the AGV/AMR about its surroundings.
- They are used for object detection, recognition, and tracking.
- Examples of Vision sensors used in AGVs/AMRs are Intel RealSense and Basler Vision sensors.

Data Collection (Ultrasonic Sensors)

SICK Ultrasonic Sensors

MaxBotix

- Ultrasonic sensors use sound waves to detect the distance between the AGV/AMR and obstacles in the environment.
- They are used for obstacle avoidance and positioning.
- Examples of ultrasonic sensors used in AGVs/AMRs are MaxBotix and SICK Ultrasonic Sensors.

Data Transmission

Bluetooth Module

Ethernet Cable

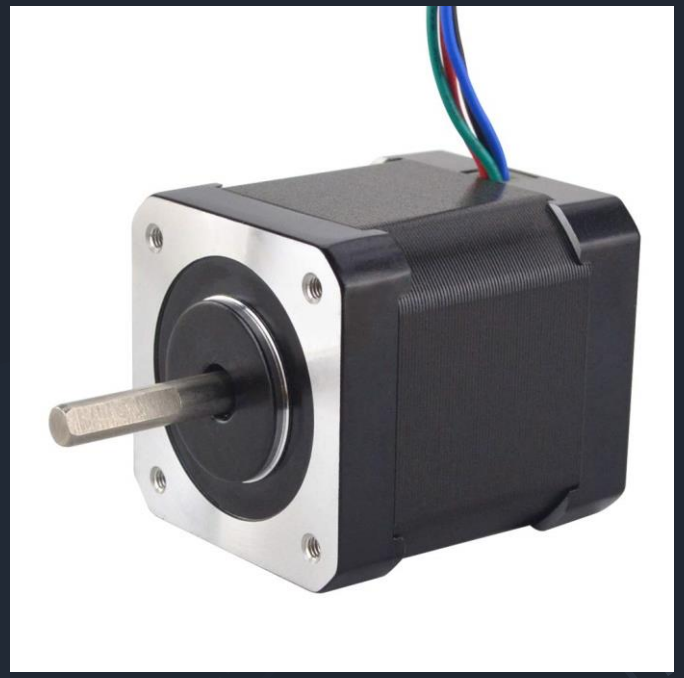
Sierra Wireless Modem

Archer C1200 (WIFI)

Digi International modems.

- The data transmission hardware enables the vehicles to communicate with the control system and exchange information with other devices in the environment.

1. Wi-Fi: Wi-Fi is a commonly used wireless communication technology in AGVs/AMRs. It enables the vehicles to communicate with the control system and exchange data in real-time. Examples of Wi-Fi devices used in AGVs/AMRs are wireless routers and access points.
2. Bluetooth: Bluetooth is another wireless communication technology used in AGVs/AMRs. It is used for short-range communication between the AGV/AMR and other devices in the environment. Examples of Bluetooth devices used in AGVs/AMRs are Bluetooth sensors and tags.
3. Cellular Modems: Cellular modems are used to provide long-range communication in AGVs/AMRs. They use cellular networks to enable communication between the AGV/AMR and the control system. Examples of cellular modems used in AGVs/AMRs are Sierra Wireless modems and Digi International modems.
4. Ethernet: Ethernet is a wired communication technology used in AGVs/AMRs. It enables the vehicles to communicate with the control system using cables. Examples of Ethernet devices used in AGVs/AMRs are Ethernet switches and routers.



Stepper Motor Bipolar 2A 84oz.in 48mm 4-Lead

RS-775 Electric DC Motor

Actuators (Motors)

- Actuation hardware is used in AGVs and AMRs to carry out the tasks assigned to them.
- Motors are used to provide the necessary power to move the AGV/AMR.
- They are used for propulsion, steering, and lifting.
- Examples of motors used in AGVs/AMRs are DC motors and Stepper motors.

Schunk Grippers

Robotiq Grippers

Actuators (Grippers)

- Grippers are used to grasp and manipulate objects.
- They are used in material handling applications where the AGV/AMR is required to pick up and move objects.
- Examples of grippers used in AGVs/AMRs are Robotiq Grippers and Schunk Grippers.

Power Management (Batteries & Charger)

1. Batteries: Batteries are used to provide power to the AGV/AMR. They are used for propulsion, steering, and powering the computing and sensing hardware. Examples of batteries used in AGVs/AMRs are Lithium-Ion batteries and Nickel-Metal Hydride batteries.
2. Chargers: Chargers are used to recharge the batteries used in AGVs/AMRs. They are used to maintain the AGV/AMR's operational time and ensure the reliability of the

Lithium-Ion batteries

Nickel-Metal Hydride batteries

Summary

In conclusion, AGVs and AMRs are complex systems that rely on several hardware components to operate. These components include the computing and sensing hardware, power and energy storage hardware, locomotion hardware, and data transmission hardware. The computing and sensing hardware enable AGVs and AMRs to perceive their environment and make decisions based on that information. Power and energy storage hardware provide the energy needed to power the vehicles. Locomotion hardware enables the vehicles to move and navigate in their environment. Finally, data transmission hardware enables AGVs and AMRs to communicate with the control system and exchange information with other devices in the environment. The selection of hardware components depends on the specific requirements of the application and the environment in which the AGV/AMR operates. By carefully selecting and integrating these hardware components, AGVs and AMRs can perform a wide range of tasks autonomously, improving efficiency and safety in various industries.